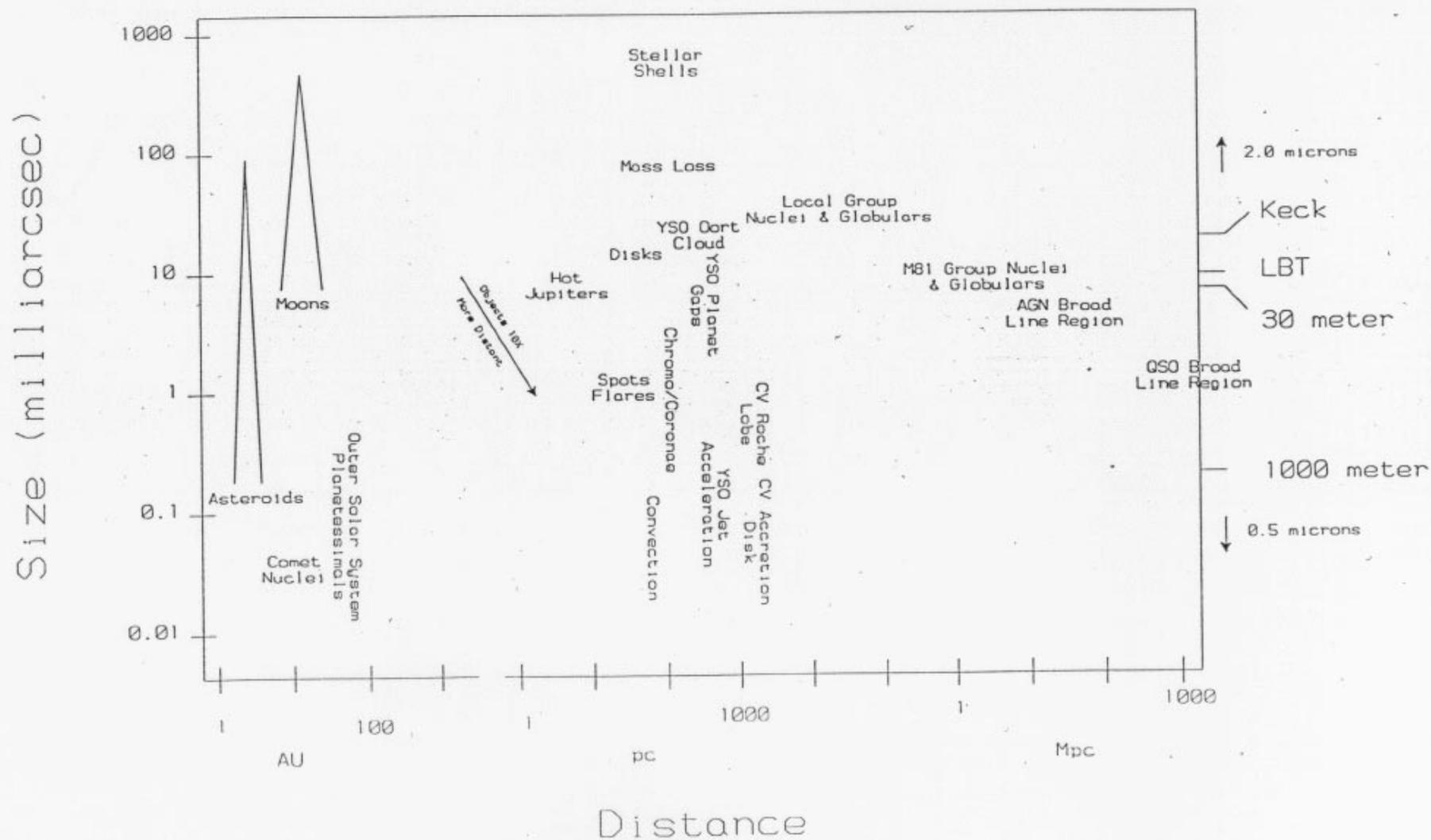


Interferometric Facilities of Today and Tomorrow

Facility	Name	Number of Telescopes	Aperture (meters)	Baseline (meters)
COAST	Cambridge Optical Aperture Synthesis Telescope	5	0.40	20
GI2T	Grande Interfèromètre à 2 Telescopes	2 *	1.52	65
IOTA	Infrared Optical Telescope Array	2 *	0.40	38
ISI	Infrared Spatial Interferometer	2 *	1.65	85 *
MIRA-I	Mitaka Infrared Array	2 *	0.25 *	4 *
NPOI	Navy Prototype Optical Interferometer	3 *	0.12 *	35 *
PTI	Palomar Testbed Interferometer	3	0.40	110
SUSI	Sidney University Stellar Interferometer	2	0.14	640
CHARA	Center for High Angular Resolution Astro	6	1.0	350
Keck	K1-K2	2	10.	60
Keck	Auxiliary array upgrade (NASA Origins)	4	1.8	140
LBT	Large Binocular Telescope	2	8.4	23
VIMA	VLT Interferometer Main Array	4	8.0	130
VISA	VLT Interferometer Sub-Array	2	1.8	202

Apparent source size, telescope resolution at 1 micron.



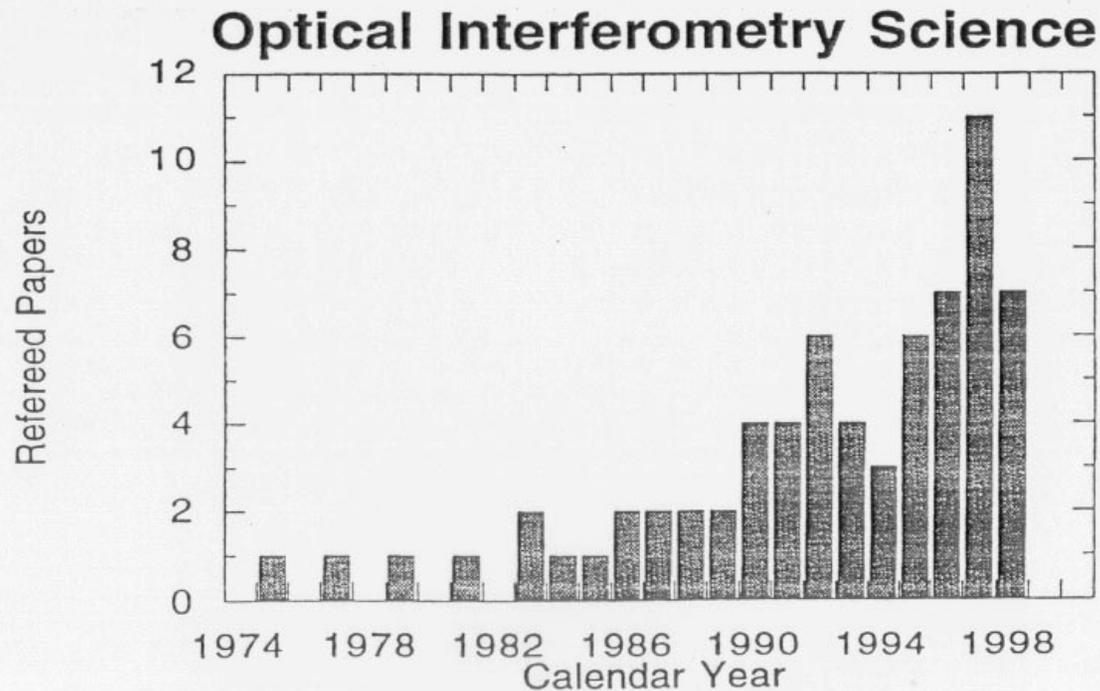
Refereed Papers in Optical Interferometry Science

Papers by facility:

I2T	14
ISI	11
MkIII	16
GI2T	9
IRMA	3
IOTA	5
COAST	3
NPOI	3

Papers by Topic:

Stellar Angular Diameter	23
Shells of Late Type Stars	11
Be/P Cyg Shells	8
Binary Star Orbits	10
Stellar Atmospheres	6
Wide Angle Astrometry	2
Novae	1
Cepheids	1



Developing a concept for a next-generation interferometric array.

Requirements:

- Resolution
- Imaging capability
- Sensitivity
- Science breadth

Ground-based => infrared operation
1000 - 3000 nm

Resolution => large baseline
1000 meters
200 microarcsec resolution at 1200 nm
20 microarcsec measurement

Imaging capability => many telescopes

Sensitivity => AO, large total aperture
large individual apertures
many telescopes

Science breadth

- => dual beam
- => configurable
- => snapshot capability
- => available

Affordable

Concept Summary

Infrared Very Large Array (IRVLA)

Large baseline

eg 1000 meters

Many telescopes

eg 27

Large unit telescope apertures

eg 3-4 meters

Adaptive optics equipped

eg curvature sensing based

Dual beam operation

eg, PTI/Keck

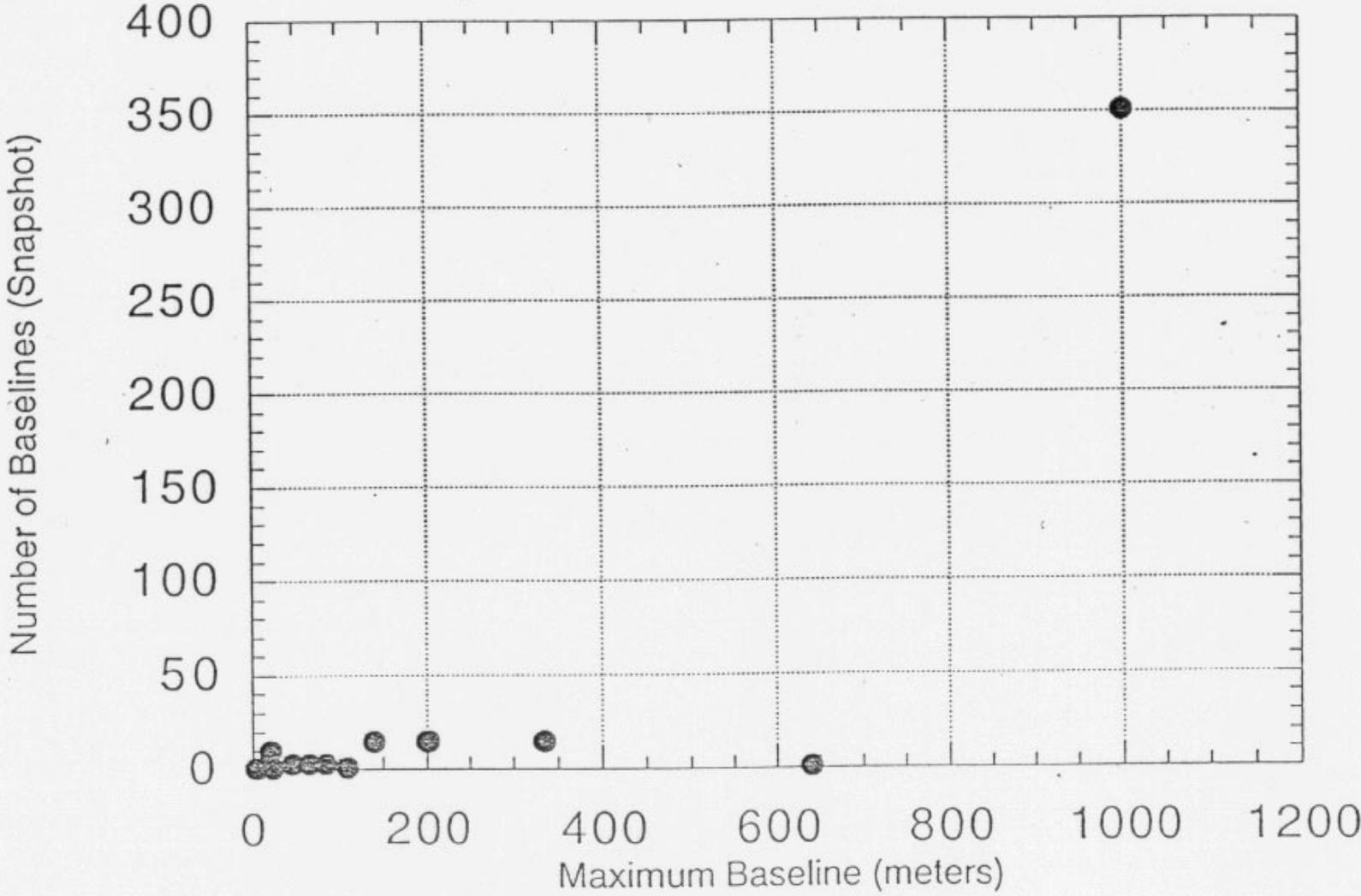
Reconfigurable

eg, telescopes on rails (OCA, VLA)

Dedicated facility

Multi-national collaboration

Array Baseline Characteristics



Demonstrated Performance of AO

Performance of operational natural guide star adaptive optics systems ADAPT At Mt. Wilson (Mt. Wilson Institute, private communication from C. Shelton), and PUEO (Canada-France-Hawaii on Mauna Kea, from the CFHT WEB pages.)

	ADAPT				PUEO		
	B	V	R	I	J	H	K
Median Strehl =	0.02	0.07	0.15	0.30	0.27	0.41	0.56
Strehl attenuation 50% at magnitude R =		10.0			14.3	15.0	15.7
Strehl attenuation 50% at field angle =					20"	30"	40"

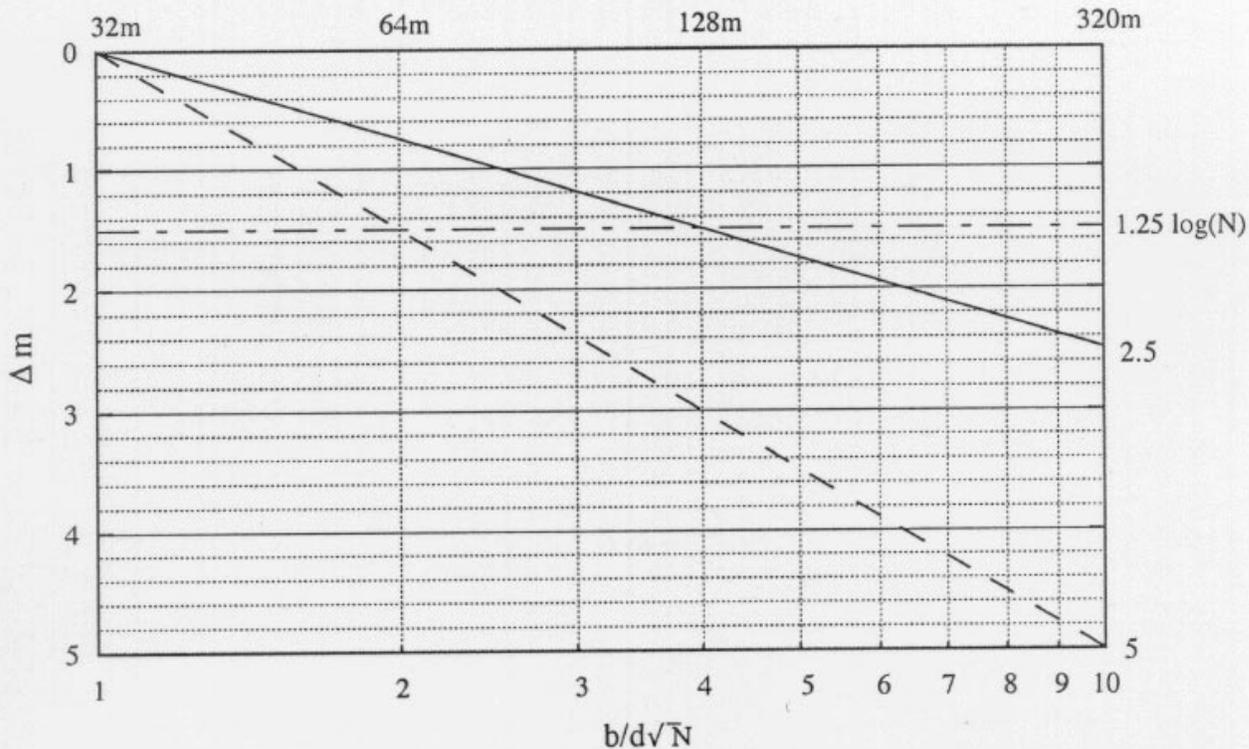


Fig. 1.— The shift in limiting magnitude when a fixed total collecting area is redistributed from a filled to an unfilled configuration. The lower scale shows the ratio of the maximum baseline to the diameter of the filled aperture (square root of the filling factor). The upper scale shows the corresponding maximum baseline for an array of sixteen 8-m telescopes. Two cases are considered: sky background noise (*full line*), and signal photon or detector noise (*dashed line*). For comparison, the horizontal (*dash-dot*) line is for sixteen telescopes incoherently recombined observing a background-limited point source.

"Filling factor and signal-to-noise ratios in optical interferometry",
 F. Roddier and S.T. Ridgway, PASP (in press).

Source Type	Typical Distance	Resolved	Partially Resolved
Asteroid, comet	2 AU	200 m	20 m
M dwarf	5 pc	0.5 R*	0.05 R*
Evolved star	100 pc	0.02 R*	0.002 R*
YSO	400 pc	0.04 AU	0.004 R*
Recurrent nova	2 kpc	0.4 AU	0.04 AU
Relativistic disk	5 kpc	1 AU	0.1 AU
Local group galaxy	16 kpc	3.2 AU	0.3 AU
M81 group	3.4 Mpc	0.003 pc	6 AU
Seyfert, BL Lac	10 Mpc	0.01 pc	18 AU
Virgo cluster	19 Mpc	0.02 pc	0.002 pc
Quasar	1500 Mpc	1.4 pc	0.14 pc

An Infrared Very Large Array for the 21st Century

- Interferometry's decade of development is winding up
- Science productivity is strong and accelerating
- Intermediate facilities coming on-line now
- Next step - an IRVLA - imaging/resolution/sensitivity
- IRVLA enables study of compact sources with unprecedented detail
- Ramp-up to IRVLA can begin today
- IRVLA will happen